BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

As rescanning documents *will not* correct images, please do not report the images to the Image Problem Mailbox.

Examiner's Copy

AN 121:40618 HCA
TI **Copper** alloy plates having microstructure for electric and electronic parts
IN Suzuki, Takeshi; Futatsuka, Rensei; Kumagai, Seiji; Kuwabara, Manpei; Chiba, Shunichi; Sakakibara, Tadao; Odajima, Micho; Kumagai, Junichi
PA Mitsubishi Shindo Kk, Japan
SO Jpn. Kokai Tokkyo Koho, 9 pp.
CODEN: JKXXAF
DT Patent
LA Japanese
FAN.CNT 1

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 06041660	A2	19940215	JP 1992-220855	19920728

AB The alloy plates contain **Ni** 0.4-5, **Si** 0.05-1.2, **Sn** 0.07-2.5, **Mg** 0.001-0.2, **Zn** 0.1-3, Fe 0.007-0.25, and Mo 0.0002-0.03% and have av. crystal grain size .ltoreq.30 .mu.m and max. pptn. diam. .ltoreq.3 .mu.m. The alloy plates have smooth surface after etching and have bend-workability.

(19)日本国特許庁（ＪＰ）　(12)**公開特許公報（Ａ）**　(11)特許出願公開番号

特開平6－41660

(43)公開日　平成６年(1994)２月15日

(51)Int.Cl.[5]	識別記号	庁内整理番号	ＦＩ	技術表示箇所
Ｃ２２Ｃ　9/06				
Ｃ２２Ｆ　1/08		Ｐ		
		Ｂ		
Ｈ０１Ｌ　23/48		Ｖ		

審査請求　未請求　請求項の数１(全　９　頁)

(21)出願番号　特願平4－220855

(22)出願日　平成４年(1992)７月28日

(71)出願人　000176822
三菱伸銅株式会社
東京都中央区銀座１丁目６番２号

(72)発明者　鈴木　竹四
福島県会津若松市扇町128－７　三菱伸銅株式会社若松製作所内

(72)発明者　二塚　錬成
福島県会津若松市扇町128－７　三菱伸銅株式会社若松製作所内

(72)発明者　熊谷　誠司
福島県会津若松市扇町128－７　三菱伸銅株式会社若松製作所内

(74)代理人　弁理士　富田　和夫　(外１名)

最終頁に続く

(54)【発明の名称】　微細組織を有する電気電子部品用Ｃｕ合金板材

(57)【要約】

【目的】　エッチング面が平滑で、曲げ加工性の良好な電気電子部品用高強度Ｃｕ合金板材を提供する。

【構成】　電気電子部品用高強度Ｃｕ合金板材が、重量％で、Ｎｉ：０．４～５％、Ｓｉ：０．０５～１．２％、Ｓｎ：０．０７～２．５％、Ｍｇ：０．００１～０．２％、Ｚｎ：０．１～３％、Ｆｅ：０．００７～０．２５％、Ｍｏ：０．０００２～０．０３％を含有し、残りがＣｕと不可避不純物からなる組成、並びに平均結晶粒径が３０μｍ以下にして、析出物の最大径が３μｍ以下である微細組織を有する。

1

【特許請求の範囲】

【請求項1】　重量%で、Ni：0．4～5%、Si：0．05～1．2%、Sn：0．07～2．5%、Mg：0．001～0．2%、Zn：0．1～3%、Fe：0．007～0．25%、Mo：0．0002～0．03%、を含有し、残りがCuと不可避不純物からなる組成、並びに平均結晶粒径が30μm以下にして、析出物の最大径が3μm以下である微細組織を有することを特徴とする電気電子部品用Cu合金板材。

【発明の詳細な説明】

【0001】

【産業上の利用分野】この発明は、微細組織を有し、この結果エッチング面の面粗さが著しく小さく、かつすぐれた曲げ加工性を示すようになる電気電子部品用Cu合金板材に関するものである。

【0002】

【従来の技術】従来、半導体装置のリード材や、端子およびコネクターなどの各種電気電子部品の製造に、例えば特開昭63－86838号公報に記載されるような、重量%で（以下、%は重量%を示す）、Ni：0．8～4%、Si：0．1～1．2%、Sn：1～4%、Mg：0．2%以下、を含有し、残りがCuと不可避不純物からなる組成を有するCu合金板材はじめ、その他多くのCu合金板材が用いられている。

【0003】

【発明が解決しようとする課題】一方、近年の各種電気電子部品の小型化および軽量化（薄肉化）、さらに高集積化はめざましく、これに伴ないCu合金板材には、強度のほかに、特に平滑な、すなわち面粗さの小さいエッチング面、および厳しい条件下での曲げ加工にも割れの発生がない、すぐれた曲げ加工性が要求され、例えば半導体装置のリードフレーム材に高集積度の回路パターンをエッチングにて形成するに際しては、エッチング後の表面が平滑であることが不可欠であるが、上記の従来Cu合金板材においては、溶体化処理および析出処理した状態で、通常平均結晶粒径が50～100μmにして、主体がNi_2Siなどのニッケルけい化物からなる析出物も、その径が5μmを越えるものが数多く存在するために、これが原因でエッチング面の面粗さが荒れるようになるばかりでなく、曲げ加工に際して割れが発生し易くなるという問題がある。

【0004】

【課題を解決するための手段】そこで、本発明者等は、微細組織のCu合金板材を開発すべく研究を行なった結果、Ni：0．4～5%、Si：0．05～1．2%、Sn：0．07～2．5%、Mg：0．001～0．2%、Zn：0．1～3%、Fe：0．007～0．25%、Mo：0．0002～0．03%、を含有し、残りがCuと不可避

2

不純物からなる組成を有するCu合金板材は、溶体化処理とこれに引続いての析出処理（時効処理）を施した状態で、平均粒径が30μm以下にして、析出物の最大径が3μm以下である微細組織をもつようになり、このように微細組織のCu合金板材は、表面粗さ：1μm以下の平滑なエッチング面を示すほか、すぐれた曲げ加工性および高強度を具備し、さらにすぐれたはんだ耐熱剥離性も有するようになるという研究結果を得たのである。

【0005】この発明は、上記の研究結果にもとづいてなされたものであって、Ni：0．4～5%、Si：0．05～1．2%、Sn：0．07～2．5%、Mg：0．001～0．2%、Zn：0．1～3%、Fe：0．007～0．25%、Mo：0．0002～0．03%、を含有し、残りがCuと不可避不純物からなる組成、並びに平均結晶粒径が30μm以下にして、析出物の最大径が3μm以下である微細組織を有する、特にエッチング面が平滑で、曲げ加工性にすぐれ、かつはんだ耐熱剥離性にもすぐれた電気電子部品用Cu合金板材に特徴を有するものである。

【0006】つぎに、この発明のCu合金板材において、その成分組成を上記の通りに限定した理由を説明する。

（a）　NiおよびSi

これらの成分には、析出処理後に素地に微細に分散析出する、主体がNi_2Siからなる析出物を形成し、もって導電性を大幅に低下させることなく強度を向上させる作用があるが、その含有量が、それぞれNi：0．4%未満およびSi：0．05%未満では所望の強度を確保することができず、一方その含有量がNi：5%およびSi：1．2%を越えると、導電性およびはんだ耐熱剥離性が低下するようになることから、その含有量をそれぞれNi：0．4～5%、Si：0．05～1．2%と定めた。

【0007】（b）　Sn

Sn成分には、素地に固溶して強度を一段と向上させる作用があるが、その含有量が0．07%未満では前記作用に所望の効果が得られず、一方その含有量が2．5%を越えると導電性が低下するようになることから、その含有量を0．07～2．5%と定めた。

【0008】（c）　Mg

Mg成分には、熱間加工性を向上させる作用があるが、その含有量が0．001%未満では所望の熱間加工性向上効果が得られず、一方その含有量が0．2%を越えると、鋳塊にMg酸化物などが巻き込まれ易くなり、これが原因で熱延性および表面清浄性が損なわれるようになることから、その含有量を0．001～0．2%と定めた。

【0009】（d）　Zn

Zn成分には、素地に固溶して、はんだ耐熱剥離性を向

上させる作用があるが、その含有量が0．1%未満では所望のはんだ耐熱剥離性を確保することができず、一方その含有量が3%を越えてもより一層の向上効果は現われないことから、その含有量を0．1～3%と定めた。

【0010】(e)　FeおよびMo

これらの成分には、溶体化処理の高温加熱に際しての結晶粒の粗大化を抑制するほか、析出物の粗大化を阻止し、もってエッチング後の表面粗さを1μm以下に平滑化すると共に、厳しい曲げ加工にも割れの発生を抑制する作用があるが、その含有量が、それぞれFe：0．007%未満およびMo：0．0002%未満では前記作用に所望の効果が得られず、一方その含有量がFe：0．25%およびMo：0．03%を越えると熱間圧延性および曲げ加工性が低下するようになることから、その含有量をFe：0．007～0．25%、Mo：0．0002～0．03%と定めた。

【0011】

【実施例】つぎに、この発明のCu合金板材を実施例により具体的に説明する。通常の低周波溝型溶解炉にて、それぞれ表1～3に示される成分組成をもったCu合金溶湯を調製し、半連続鋳造法にて厚さ：160mm×幅：450mm×長さ：1600mmの寸法をもった鋳塊とし、この鋳塊に、750～980℃の範囲内の所定の圧延開始温度で熱間圧延を施して厚さ：11mmの熱延板とし、この熱延板に、水冷後、上下両面を0．5mmづつ、両側端部を3mmづつそれぞれ面削した状態で、圧延率：87%の冷間圧延を施して厚さ：1．32mmの冷延板とし、さらにこれに400～650℃の範囲内の所定温度に1時間保持の中間焼純を施した状態で、圧延率：75%の冷間圧延を施して厚さ：0．33mmの冷延板とし、ついでこれに750～950℃の範囲内の所定温度に5～300秒保持した後、750～500℃の温度範囲を40℃／sec 以上の冷却速度で冷却する溶体化処理を施し、引続いて400～500℃の範囲内の所定温度に3時間保持の析出処理を施し、さらに圧延率：25%の冷間圧延を行ない、最終的に250～350℃の範囲内の所定温度に1時間保持の歪取り焼鈍を施すことにより、同じく表1～3にそれぞれ示される平均結晶粒径および析出物最大径の本発明Cu合金板材1～14、比較Cu合金板材1～9、および従来Cu合金板材1～4をそれぞれ製造した。

【0012】なお、比較Cu合金板材1～9は、Cu合金の構成成分のうちのいずれかの成分含有量（＊印を付す）がこの発明範囲から外れたものである。また、平均結晶粒径は光学顕微鏡を用いて測定し、さらに析出物については、走査型電子顕微鏡を用い、5000倍の倍率にて任意10ヶ所を測定し、この測定箇所のうちで最大径を示した析出物を示した。

【0013】つぎに、この結果得られた各種のCu合金板材について、JIS・Z2241に基づいての引張試験にて引張強さと伸びを測定し、同じくJIS・H0505に基づいて導電率を測定し、さらに曲げ加工試験およびはんだの熱剥離試験を行ない、エッチング面の表面粗さも測定した。

【0014】曲げ加工試験は、JIS・Z2248のVブロック法に準じ、曲げ軸を圧延平行方向（bad way 方向）にとり、試験片の表面に割れが発生する最小曲げ半径：r（mm）を測定し、このrと試験片の厚さ：tとの比：r／tで評価することにより行なった。

【0015】はんだの熱剥離試験は、厚さ：0．25mm×幅：15mm×長さ：60mmの寸法をもった試験片を、ロジンフラックスで処理し、温度：230℃の60%Sn－40%Pb合金のはんだ浴中に浸漬して、その表面に前記はんだを付着させ、この状態で、大気中、温度：150℃に1000時間保持の条件で加熱し、加熱後、試験片を180°密着曲げし、再び180°曲げ戻す条件で行ない、この180°曲げ部におけるはんだ剥離の有無を観察し、はんだの耐熱剥離性を評価した。

【0016】また、エッチング面の表面粗さは、試験片の表面を脱脂した後、温度：45℃の42%塩化第二鉄水溶液に浸漬して厚さ方向に0．1±0．02mmエッチングし、この結果のエッチング面について、圧延方向に対して直角方向に長さ：0．8mmづつ任意10ヶ所の表面粗さを測定し、この10ヶ所の測定結果のうちで最も高い（粗い）表面粗さをもって示した。これらの測定結果を表4，5に示した。

【0017】

【表1】

種別		成分組成（重量％）								平均結晶粒径（μm）	析出物の最大径（μm）
		Ni	Si	Sn	Mg	Zn	Fe	Mo	Cu+不純物		
本発明Cu合金板材	1	0.48	0.07	2.41	0.121	0.90	0.211	0.0128	残	8	0.6
	2	1.95	0.51	0.47	0.005	0.87	0.012	0.0004	残	15	1.3
	3	4.67	1.12	0.51	0.008	0.95	0.062	0.0008	残	8	1.6
	4	1.88	0.47	0.09	0.011	1.02	0.051	0.0011	残	12	0.8
	5	1.96	0.44	0.56	0.008	1.06	0.055	0.0009	残	10	0.9
	6	1.83	0.45	2.23	0.009	0.92	0.048	0.0008	残	11	0.8
	7	1.95	0.52	0.51	0.010	0.12	0.070	0.0008	残	10	0.9
	8	2.02	0.45	0.44	0.008	2.94	0.066	0.0006	残	12	1.1
	9	2.12	0.50	0.49	0.002	0.93	0.032	0.0013	残	8	0.6
	10	1.95	0.48	0.52	0.189	0.95	0.045	0.0008	残	10	1.0

【0018】

＊ ＊【表2】

種別		成分組成（重量％） Ni	Si	Sn	Mg	Zn	Fe	Mo	Cu+不純物	平均結晶粒径 (μm)	析出物の最大径 (μm)
本発明Cu合金板材	11	1.93	0.40	0.47	0.003	1.02	0.008	0.0009	残	25	1.1
	12	1.89	0.53	0.46	0.013	0.88	0.238	0.0011	残	10	0.7
	13	2.04	0.44	0.49	0.009	0.87	0.014	0.0003	残	25	1.5
	14	1.93	0.47	0.51	0.011	0.85	0.058	0.0252	残	6	0.5
比較Cu合金板材	1	0.33*	0.10	0.45	0.008	0.85	0.021	0.0006	残	18	1.1
	2	5.19*	1.11	0.85	0.003	0.72	0.043	0.0004	残	14	2.0
	3	2.03	0.04*	0.43	0.009	0.84	0.045	0.0011	残	18	0.7
	4	2.15	1.34*	0.64	0.006	0.82	0.065	0.0009	残	8	0.9
	5	1.78	0.40	0.05*	0.005	0.81	0.052	0.0004	残	12	1.5
	6	1.95	0.45	2.72*	0.008	0.83	0.055	0.0008	残	10	0.9

（＊印：本発明範囲外）

【0019】

＊ ＊【表3】

種別		成分組成（重量％）								平均結晶粒径（μm）	析出物の最大径（μm）
		Ni	Si	Sn	Mg	Zn	Fe	Mo	Cu+不純物		
比較Cu合金板材	7	1.94	0.67	0.44	0.004	0.08*	0.043	0.0010	残	11	1.1
	8	2.03	0.47	0.51	0.004	0.83	0.005*	－*	残	50*	6.5*
	9	1.93	0.58	0.38	0.009	0.95	0.283*	0.0342*	残	8	0.6
従来Cu合金板材	1	0.93	0.23	2.06	0.104	－	－	－	残	70	5.5
	2	1.98	0.63	0.78	0.011	－	－	－	残	65	7.5
	3	3.85	1.09	0.63	0.102	－	－	－	残	50	8.0
	4	1.94	0.77	3.92	0.096	－	－	－	残	60	7.0

（＊印：本発明範囲外）

【0020】 ＊ ＊【表4】

11　　12

種別		引張強さ (N／mm²)	伸び (%)	導電率 (%IACS)	曲げ加工性 (r／t)	はんだ剥離の有無	エッチング面の表面粗さ (μm)
本発明Cu合金板材	1	760	6	35	1.6	無	0.7
	2	815	9	43	1.4	無	0.8
	3	920	9	36	1.6	無	0.9
	4	780	7	49	1.2	無	0.8
	5	810	9	42	1.2	無	0.8
	6	860	10	35	0.8	無	0.7
	7	815	9	44	1.0	無	0.7
	8	815	8	39	1.2	無	0.8
	9	820	7	43	1.2	無	0.7
	10	815	8	38	1.0	無	0.8
	11	810	9	43	1.6	無	0.8
	12	815	8	41	1.0	無	0.8
	13	805	9	42	1.6	無	0.9
	14	790	6	43	1.6	無	0.7

【0021】　　＊　＊【表5】

13　　14

種別		引張強さ (N/mm²)	伸び (%)	導電率 (%) IACS	曲げ加工性 (r/t)	はんだ剥離の有無	エッチング面の表面粗さ (μm)
比較Cu合金板材	1	580	8	48	1.6	無	0.9
	2	920	9	30	1.8	有	1.2
	3	520	7	38	1.0	無	0.9
	4	810	9	31	1.8	有	0.7
	5	680	8	53	1.8	無	0.9
	6	850	9	24	1.0	無	0.8
	7	820	8	37	1.8	有	0.8
	8	810	8	38	5.0	無	3.0
	9	810	4	39	3.6	無	0.7
従来Cu合金板材	1	780	7	36	3.8	有	2.9
	2	810	8	33	6.0	有	3.2
	3	870	9	35	6.5	有	3.5
	4	900	9	20	4.5	有	3.0

【0022】

【発明の効果】表1～5に示される結果から、本発明Cu合金板材1～14は、いずれも従来Cu合金板材1～4と同等の高強度と導電率をもち、一方エッチング面の表面粗さおよび曲げ加工性、さらにはんだの耐熱剥離性については、従来Cu合金板材1～4に比して一段とすぐれたものになっており、また比較Cu合金板材1～9に見られるように、Cu合金の構成成分のうちのいずれかの成分含有量がこの発明の範囲から外れると上記の特性のうちの少なくともいずれかの特性が劣ったものにな＊ることが明らかである。

【0023】上述のように、この発明のCu合金板材は、特にエッチング面が平滑で、かつすぐれた曲げ加工性を有し、さらにはんだの耐熱剥離性にもすぐれているので、これらの特性が要求される集積度の高い半導体装置のリードフレーム材や、形状が複雑にして薄肉化の傾向にある端子およびコネクターなどの各種電気電子部品の製造に用いた場合に長期に亘ってすぐれた性能を発揮するのである。

フロントページの続き

(72)発明者　桑原　萬平
福島県会津若松市扇町128－7　三菱伸銅株式会社若松製作所内
(72)発明者　千葉　俊一
福島県会津若松市扇町128－7　三菱伸銅株式会社若松製作所内
(72)発明者　榊原　直男
福島県会津若松市扇町128－7　三菱伸銅株式会社若松製作所内
(72)発明者　小田嶋　美智代
福島県会津若松市扇町128－7　三菱伸銅株式会社若松製作所内
(72)発明者　熊谷　淳一
福島県会津若松市扇町128－7　三菱伸銅株式会社若松製作所内

PATENT ABSTRACTS OF JAPAN

(11)Publication number : **06-041660**
(43)Date of publication of application : **15.02.1994**

(51)Int.CI. **C22C 9/06**
C22F 1/08
H01L 23/48

(21)Application number : **04-220855**
(22)Date of filing : **28.07.1992**

(71)Applicant : **MITSUBISHI SHINDOH CO LTD**
(72)Inventor : **SUZUKI TAKESHI**
FUTATSUKA RENSEI
KUMAGAI SEIJI
KUWABARA MANPEI
CHIBA SHUNICHI
SAKAKIBARA TADAO
ODAJIMA MICHIYO
KUMAGAI JUNICHI

(54) CU ALLOY STEEL HAVING FINE STRUCTURE FOR ELECTRIC AND ELECTRONIC PARTS

(57)Abstract:
PURPOSE: To provide a high strength Cu alloy sheet for electric and electronic parts having a smooth etching face and good in bendability.

CONSTITUTION: The high strength Cu alloy sheet for electric and electronic parts has a compsn. contg., by weight, 0.4 to 5% Ni, 0.05 to 1.2% Si, 0.07 to 2.5% Sn, 0.001 to 0.2% Mg, 0.1 to 3% Zn, 0.007 to 0.25% Fe and 0.0002 to 0.03% Mo, and the balance Cu with inevitable impurities and has a fine structure in which the average grain diameter is regulated to be 30μm or smaller and the maximum diameter of precipitates is regulated to be 3μm or smaller.

LEGAL STATUS

[Date of request for examination]	13.04.1999
[Date of sending the examiner's decision of rejection]	
[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]	
[Date of final disposal for application]	
[Patent number]	3275377
[Date of registration]	08.02.2002
[Number of appeal against examiner's decision of rejection]	
[Date of requesting appeal against examiner's decision of rejection]	
[Date of extinction of right]	

CLAIMS

[Claim]
[Claim 1] By weight %, nickel:0.4-5%, Si: 0.05-1.2%, Sn:0.07-2.5%, Mg: 0.001-0.2%, Zn:0.1-3%, Contain Fe:0.007-0.25% and Mo:0.0002-0.03%, and the composition which the remainder becomes from Cu and an unescapable impurity, and the diameter of mean crystal grain make it 30 micrometers or less. Cu alloy plate for electric electronic parts characterized by having the detailed organization whose overall diameter of a sludge is 3 micrometers or less.

[Translation done.]

DETAILED DESCRIPTION

[Detailed description]
[0001]
[Field of the Invention] This invention has a detailed organization and relates to Cu alloy plate for electric electronic parts the field granularity of an etching side, as a result, comes to indicate the bending nature which was remarkably small and was excellent to be.
[0002]
[Prior art] % is nickel:(which shows weight % hereafter)0.8-4% at weight % which is conventionally indicated by manufacture of various electric electronic parts, such as the lead material of a semiconductor device, and a terminal, a connector, for example, at a Provisional-Publication-No. 86838 [63 to] official report. Si:0.1-1.2%, Sn:1-4%, Mg: Less than [0.2%] is contained and Cu alloy plate of the start of Cu alloy plate which has the composition which the remainder becomes from Cu and an unescapable impurity, in addition many is used.
[0003]
[Object of the Invention] High integration is still remarkable and it follows on this. on the other hand -- a miniaturization of various electric electronic parts in recent years, and lightweight-izing (thinning) -- to Cu alloy plate Besides an intensity, are especially smooth. field granularity A parvus etching side, And although the outstanding bending nature which does not have occurrence of a crack in the bending under a severe condition, either is demanded, for example, it faces forming a highly-integrated circuit pattern in the leadframe material of a semiconductor device in etching and it is indispensable that the front face after etching is smooth In the above-mentioned conventional Cu alloy plate, it is in solution treatment and the status which carried out precipitation processing. Usually, since many things to which the path exceeds 5 micrometers exist, the sludge which the diameter of mean crystal grain makes it 50-100 micrometers, and a subject becomes from nickel silicification objects, such as nickel2 Si Not only the field granularity of an etching side comes to be ruined owing to this, but there is a problem become easy to generate a crack in case of a bending.
[0004]
[The means for solving a technical problem] As a result of inquiring that this invention person etc. should develop Cu alloy plate of a detailed organization, then, nickel:0.4-5%, Si: 0.05-1.2%, Sn:0.07-2.5%, Mg: 0.001-0.2%, Zn:0.1-3%, Cu alloy plate which has the composition which Fe:0.007-0.25% and Mo:0.0002-0.03% are contained, and the remainder becomes from Cu and an unescapable impurity Where precipitation processing (aging treatment) which follows solution treatment and this is performed A mean particle diameter makes it 30 micrometers or less, and the overall diameter of a sludge comes to have the detailed organization which is 3 micrometers or less. in this way Cu alloy plate of a detailed organization Surface-roughness: The smooth etching side not more than 1micrometer was shown, and also the outstanding bending nature and outstanding high intensity were provided, and the research result of also coming to have the further excellent solder heat-proof detachability was obtained.
[0005] This invention is made based on the above-mentioned research result. nickel:0.4-5%, Si: 0.05-1.2%, Sn:0.07-2.5%, Mg: 0.001-0.2%, Zn:0.1-3%, Contain Fe:0.007-0.25% and Mo:0.0002-0.03%, and the composition which the remainder becomes from Cu and an unescapable impurity, and the diameter of mean crystal grain make it 30 micrometers or less. It has the characteristic feature in Cu alloy plate for electric electronic parts which has the detailed organization whose overall diameter of a sludge is 3 micrometers or less and which especially whose etching side was smooth, and was excellent in bending nature, and was excellent also in the solder heat-proof detachability.
[0006] Below, in Cu alloy plate of this invention, the ground which limited the component composition as above-mentioned is explained.
(a) nickel and Si, although the component of these has the operation which raises an intensity, without forming and having in a base the sludge which carries out a distributed precipitation minutely and which a subject becomes from nickel2 Si, and reducing conductivity sharply after precipitation processing If the content cannot secure a desired intensity less than [nickel:0.4%] and less than [Si:0.05%], respectively but the content, on the other hand, exceeds nickel:5% and Si:1.2% Since conductivity and a solder heat-proof detachability came to have fallen, the content was determined as nickel:0.4-5% and Si:0.05-1.2%, respectively.
[0007] (b) Although SnSn component had the operation which it ****s [operation] on a base and raises an intensity much more, the effect of a request [at less than 0.07%] of the content to the aforementioned operation was not acquired, but since conductivity came to have fallen when the content exceeded 2.5% on the other hand, the content was determined as 0.07 - 2.5%.
[0008] (c) Since Mg oxide etc. became is easy to be involved in an ingot and heat ductility and surface-cleaning nature came to be spoiled owing to this when the hot-working disposition top effect of a request of the content at less than 0.001% is not acquired but the content exceeded 0.2% on the other hand, although MgMg component had the operation which raises hot-working nature, the content was determined as 0.001 - 0.2%.
[0009] (d) The content could not secure a desired solder heat-proof detachability at less than 0.1%, but although there was an operation which it ****s [operation] on a base and raises a solder heat-proof detachability, even if the content exceeded 3% on the other hand, since much more enhancement effect did not appear, it determined the content to ZnZn component as 0.1 - 3%.
[0010] (e) Fe and Mo -- for the component of these, although there is an operation which big and rough-ization of the crystal grain with is suppressed, and also suppresses occurrence of a crack to a severe bending while it prevents and has big and rough-ization of a sludge and

smoothing of the surface roughness after etching is carried out to 1 micrometer or less Less than [Fe:0.007%] and less than [Mo:0.0002%], a desired effect is not acquired for the content by the aforementioned operation, respectively. Since hot rolling nature and bending nature came to have fallen on the other hand when the content exceeded Fe:0.25% and Mo:0.03%, the content was determined as Fe:0.007-0.25% and Mo:0.0002-0.03%.

[0011]

[Example] Below, an example explains Cu alloy plate of this invention concretely. Cu alloy molten metal with the component composition shown in Tables 1-3 by the usual low frequency slot type smelter, respectively is prepared. It considers as the ingot which had a thickness:160mmx width-of-face:450mmx length:1600mm dimension by the semi-continuous casting method. Perform hot rolling to this ingot at the predetermined rolling start temperature within the limits of 750-980 degrees C, consider as thickness:11mm ******, and to this ******, after water cooling, where facing of every 0.5mm and the both-sides edge is carried out every 3mm, respectively, vertical both sides Where it gave the Rate:of Rolling87% cold rolling, and it considered as thickness:1.32mm ****** and interval **** of a hold is further given the predetermined temperature within the limits of 400-650 degrees C for 1 hour at this Give a Rate:of Rolling75% cold rolling, and it considers as thickness:0.33mm ******. Subsequently, after holding for 5 to 300 seconds at this to the predetermined temperature within the limits of 750-950 degrees C, It is 40 degrees C/sec about a 750-500-degree C temperature requirement. Solution treatment cooled with the above cooling rate is performed. By performing precipitation processing of a hold to the predetermined temperature within the limits of 400-500 degrees C succeedingly for 3 hours, performing a rate:of rolling25% cold rolling further, and a hold being oval to the predetermined temperature within the limits of 250-350 degrees C, and finally, giving an annealing to it for 1 hour Cu alloy plates 1-4 were manufactured, respectively this invention Cu alloy plates 1-14 of the diameter of mean crystal grain and sludge overall diameter which are similarly shown in Tables 1-3, respectively, the comparison Cu alloy plates 1-9, and conventionally.

[0012] In addition, the component content (* mark is attached) of either of the constituents of Cu alloy separates from the comparison Cu alloy plates 1-9 from this invention domain. Moreover, the diameter of mean crystal grain was measured using the light microscope, further, measured ten arbitration by one 5000 times the scale factor of this about the sludge using the scanning electron microscope, and showed the sludge which showed the overall diameter among this measurement part.

[0013] Next, about various kinds of Cu alloy plates obtained as a result, tensile strength and elongation were measured with JIS and the tension test based on Z2241, similarly conductivity was measured based on JIS and H0505, the bending examination and the heat friction test of solder were performed further, and the surface roughness of an etching side was also measured.

[0014] minimum bend-radius: in which, as for a bending examination, a crack generates a bending shaft on the surface of a test piece for a rolling parallel direction (the bad way orientation) according to JIS and the V block method of Z2248 -- r (mm) -- measuring -- the ratio of this r and thickness:t of a test piece -- it carried out by evaluating by :r/t

[0015] The heat friction test of solder processes the test piece with the thickness:0.25mmx width-of-face:15mmx length:60mm dimension by rosin flux, and is immersed during the solder bath of a temperature:230 degree C 60%Sn-40%Pb alloy. Make the aforementioned solder adhere to the front face, and it heats on condition that a hold at temperature:150 degree C among the atmospheric air in this status for 1000 hours. It carried out after heating on the conditions which carry out 180 degree adhesion bending of the test piece, and return it 180 degrees again, the existence of the solder sublation in this 180 degree bending section was observed, and the heat-resistant detachability of solder was evaluated.

[0016] moreover, temperature:45 degree C [after the surface roughness of an etching side degreases the front face of a test piece] 42% ferric-chloride aqueous solution -- being immersed -- the thickness orientation -- 0.1**0.02mm -- etching -- the etching side of this result -- a rolling direction -- receiving -- the right-angled orientation -- length: -- the surface roughness of every ten 0.8mm arbitration was measured, and it was shown with the highest (coarse) surface roughness among this ten measurement result These measurement results were shown in Tables 4 and 5.

[0017]

[Table 1]

[0018]
[Table 2]

種別		成分組成（重量%）								平均結晶粒径（μm）	析出物の最大径（μm）
		Ni	Si	Sn	Mg	Zn	Fe	Mo	Cu+不純物		
本発明Cu合金板材	1	0.48	0.07	2.41	0.121	0.90	0.211	0.0128	残	8	0.6
	2	1.95	0.51	0.47	0.005	0.87	0.012	0.0004	残	15	1.3
	3	4.67	1.12	0.51	0.008	0.95	0.062	0.0008	残	8	1.6
	4	1.88	0.47	0.09	0.011	1.02	0.051	0.0011	残	12	0.8
	5	1.96	0.44	0.56	0.008	1.06	0.055	0.0009	残	10	0.9
	6	1.83	0.45	2.23	0.009	0.92	0.048	0.0008	残	11	0.8
	7	1.95	0.52	0.51	0.010	0.12	0.070	0.0008	残	10	0.9
	8	2.02	0.45	0.44	0.008	2.94	0.066	0.0006	残	12	1.1
	9	2.12	0.50	0.49	0.002	0.93	0.032	0.0013	残	8	0.6
	10	1.95	0.48	0.52	0.189	0.95	0.045	0.0008	残	10	1.0

[0019]
[Table 3]

種別		成分組成（重量%）								平均結晶粒径（μm）	析出物の最大径（μm）
		Ni	Si	Sn	Mg	Zn	Fe	Mo	Cu+不純物		
本発明Cu合金板材	11	1.93	0.40	0.47	0.003	1.02	0.008	0.0009	残	25	1.1
	12	1.89	0.53	0.46	0.013	0.88	0.238	0.0011	残	10	0.7
	13	2.04	0.44	0.49	0.009	0.87	0.014	0.0003	残	25	1.5
	14	1.93	0.47	0.51	0.011	0.85	0.058	0.0252	残	6	0.5
比較Cu合金板材	1	0.33*	0.10	0.45	0.008	0.85	0.021	0.0006	残	18	1.1
	2	5.19*	1.11	0.85	0.003	0.72	0.043	0.0004	残	14	2.0
	3	2.03	0.04*	0.43	0.009	0.84	0.045	0.0011	残	18	0.7
	4	2.15	1.34*	0.64	0.006	0.82	0.065	0.0009	残	8	0.9
	5	1.78	0.40	0.05*	0.005	0.81	0.052	0.0004	残	12	1.5
	6	1.95	0.45	2.72*	0.008	0.83	0.055	0.0008	残	10	0.9

（＊印：本発明範囲外）

[0020]
[Table 4]

種別		成分組成（重量%）								平均結晶粒径（μm）	析出物の最大径（μm）
		Ni	Si	Sn	Mg	Zn	Fe	Mo	Cu+不純物		
比較合金Cu板材	7	1.94	0.67	0.44	0.004	0.08*	0.043	0.0010	残	11	1.1
	8	2.03	0.47	0.51	0.004	0.83	0.005*	-*	残	50*	6.5*
	9	1.93	0.58	0.38	0.009	0.95	0.283*	0.0342*	残	8	0.6
従来Cu合金板材	1	0.93	0.23	2.06	0.104	-	-	-	残	70	5.5
	2	1.98	0.63	0.78	0.011	-	-	-	残	65	7.5
	3	3.85	1.09	0.63	0.102	-	-	-	残	50	8.0
	4	1.94	0.77	3.92	0.096	-	-	-	残	60	7.0

（*印：本発明範囲外）

種別		引張強さ (N／mm^2)	伸び (%)	導電率 (%) IACS	曲げ加工性 (r／t)	はんだ剥離の有無	エッチング面の表面粗さ (μm)
本発明Cu合金板材	1	760	6	35	1.6	無	0.7
	2	815	9	43	1.4	無	0.8
	3	920	9	36	1.6	無	0.9
	4	780	7	49	1.2	無	0.8
	5	810	9	42	1.2	無	0.8
	6	860	10	35	0.8	無	0.7
	7	815	9	44	1.0	無	0.7
	8	815	8	39	1.2	無	0.8
	9	820	7	43	1.2	無	0.7
	10	815	8	38	1.0	無	0.8
	11	810	9	43	1.6	無	0.8
	12	815	8	41	1.0	無	0.8
	13	805	9	42	1.6	無	0.9
	14	790	6	43	1.6	無	0.7

[0021]
[Table 5]

種別		引張強さ (N／mm^2)	伸び (%)	導電率 (%) IACS	曲げ加工性 (r／t)	はんだ剥離の有無	エッチング面の表面粗さ (μm)
比較Cu合金板材	1	580	8	48	1．6	無	0．9
	2	920	9	30	1．8	有	1．2
	3	520	7	38	1．0	無	0．9
	4	810	9	31	1．8	有	0．7
	5	680	8	53	1．8	無	0．9
	6	850	9	24	1．0	無	0．8
	7	820	8	37	1．8	有	0．8
	8	810	8	38	5．0	無	3．0
	9	810	4	39	3．6	無	0．7
従来Cu合金板材	1	780	7	36	3．8	有	2．9
	2	810	8	33	6．0	有	3．2
	3	870	9	35	6．5	有	3．5
	4	900	9	20	4．5	有	3．0

[0022]
[Effect of the invention] From the result shown in Tables 1-5, this invention Cu alloy plates 1-14 All have high intensity and conductivity equivalent to Cu alloy plates 1-4 conventionally. on the other hand, to the surface roughness of an etching side and bending nature, and a pan about the heat-resistant detachability of solder So that it may be what was conventionally excellent much more as compared with Cu alloy plates 1-4 and the comparison Cu alloy plates 1-9 may see If the component content of either of the constituents of Cu alloy separates from the domain of this invention, it is clear to become the thing of the above-mentioned properties in which one of properties were inferior at least.
[0023] As mentioned above, since an etching side is smooth, and has the outstanding bending nature and is further excellent also in the heat-resistant detachability of solder, especially Cu alloy plate of this invention demonstrates the performance which was [the case where it uses for a manufacture of various electric electronic parts, such as the leadframe material of the high semiconductor device of a degree of integration with which these properties are demanded, and a terminal which a configuration complicates and has it in the inclination of thinning, a connector,] excellent in the long period of time.

[Translation done.]

TECHNICAL FIELD

[Field of the Invention] This invention has a detailed organization and relates to Cu alloy plate for electric electronic parts the field granularity of an etching side, as a result, comes to indicate the bending nature which was remarkably small and was excellent to be.

[Translation done.]

PRIOR ART

[Prior art] % is nickel:(which shows weight % hereafter)0.8-4% at weight % which is conventionally indicated by manufacture of various electric electronic parts, such as the lead material of a semiconductor device, and a terminal, a connector, for example, at a Provisional-Publication-No. 86838 [63 to] official report. Si:0.1-1.2%, Sn:1-4%, Mg: Less than [0.2%] is contained and Cu alloy plate of the start of Cu alloy plate which has the composition which the remainder becomes from Cu and an unescapable impurity, in addition many is used.

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the invention] From the result shown in Tables 1-5, this invention Cu alloy plates 1-14 All have high intensity and conductivity equivalent to Cu alloy plates 1-4 conventionally. on the other hand, to the surface roughness of an etching side and bending nature, and a pan about the heat-resistant detachability of solder So that it may be what was conventionally excellent much more as compared with Cu alloy plates 1-4 and the comparison Cu alloy plates 1-9 may see If the component content of either of the constituents of Cu alloy separates from the domain of this invention, it is clear to become the thing of the above-mentioned properties in which one of properties were inferior at least.

[0023] As mentioned above, since an etching side is smooth, and has the outstanding bending nature and is further excellent also in the heat-resistant detachability of solder, especially Cu alloy plate of this invention demonstrates the performance which was [the case where it uses for a manufacture of various electric electronic parts, such as the leadframe material of the high semiconductor device of a degree of integration with which these properties are demanded, and a terminal which a configuration complicates and has it in the inclination of thinning, a connector,] excellent in the long period of time.

[Translation done.]

TECHNICAL PROBLEM

[Object of the Invention] High integration is still remarkable and it follows on this. on the other hand -- a miniaturization of various electric electronic parts in recent years, and lightweight-izing (thinning) -- to Cu alloy plate Besides an intensity, are especially smooth. field granularity A parvus etching side, And although the outstanding bending nature which does not have occurrence of a crack in the bending under a severe condition, either is demanded, for example, it faces forming a highly-integrated circuit pattern in the leadframe material of a semiconductor device in etching and it is indispensable that the front face after etching is smooth In the above-mentioned conventional Cu alloy plate, it is in solution treatment and the status which carried out precipitation processing. Usually, since many things to which the path exceeds 5 micrometers exist, the sludge which the diameter of mean crystal grain makes it 50-100 micrometers, and a subject becomes from nickel silicification objects, such as nickel2 Si Not only the field granularity of an etching side comes to be ruined owing to this, but there is a problem become.easy to generate a crack in case of a bending.

[Translation done.]

MEANS

[The means for solving a technical problem] As a result of inquiring that this invention person etc. should develop Cu alloy plate of a detailed organization, then, nickel:0.4-5%, Si: 0.05-1.2%, Sn:0.07-2.5%, Mg: 0.001-0.2%, Zn:0.1-3%, Cu alloy plate which has the composition which Fe:0.007-0.25% and Mo:0.0002-0.03% are contained, and the remainder becomes from Cu and an unescapable impurity Where precipitation processing (aging treatment) which follows solution treatment and this is performed A mean particle diameter makes it 30 micrometers or less, and the overall diameter of a sludge comes to have the detailed organization which is 3 micrometers or less. in this way Cu alloy plate of a detailed organization Surface-roughness: The smooth etching side not more than 1micrometer was shown, and also the outstanding bending nature and outstanding high intensity were provided, and the research result of also coming to have the further excellent solder heat-proof detachability was obtained.
[0005] This invention is made based on the above-mentioned research result. nickel:0.4-5%, Si: 0.05-1.2%, Sn:0.07-2.5%, Mg: 0.001-0.2%, Zn:0.1-3%, Contain Fe:0.007-0.25% and Mo:0.0002-0.03%, and the composition which the remainder becomes from Cu and an unescapable impurity, and the diameter of mean crystal grain make it 30 micrometers or less. It has the characteristic feature in Cu alloy plate for electric electronic parts which has the detailed organization whose overall diameter of a sludge is 3 micrometers or less and which especially whose etching side was smooth, and was excellent in bending nature, and was excellent also in the solder heat-proof detachability.
[0006] Below, in Cu alloy plate of this invention, the ground which limited the component composition as above-mentioned is explained.
(a) nickel and Si, although the component of these has the operation which raises an intensity, without forming and having in a base the sludge which carries out a distributed precipitation minutely and which a subject becomes from nickel2 Si, and reducing conductivity sharply after precipitation processing If the content cannot secure a desired intensity less than [nickel:0.4%] and less than [Si:0.05%], respectively but the content, on the other hand, exceeds nickel:5% and Si:1.2% Since conductivity and a solder heat-proof detachability came to have fallen, the content was determined as nickel:0.4-5% and Si:0.05-1.2%, respectively.
[0007] (b) Although SnSn component had the operation which it ****s [operation] on a base and raises an intensity much more, the effect of a request [at less than 0.07%] of the content to the aforementioned operation was not acquired, but since conductivity came to have fallen when the content exceeded 2.5% on the other hand, the content was determined as 0.07 - 2.5%.
[0008] (c) Since Mg oxide etc. became is easy to be involved in an ingot and heat ductility and surface-cleaning nature came to be spoiled owing to this when the hot-working disposition top effect of a request of the content at less than 0.001% is not acquired but the content exceeded 0.2% on the other hand, although MgMg component had the operation which raises hot-working nature, the content was determined as 0.001 - 0.2%.
[0009] (d) The content could not secure a desired solder heat-proof detachability at less than 0.1%, but although there was an operation which it ****s [operation] on a base and raises a solder heat-proof detachability, even if the content exceeded 3% on the other hand, since much more enhancement effect did not appear, it determined the content to ZnZn component as 0.1 - 3%.
[0010] (e) Fe and Mo -- for the component of these, although there is an operation which big and rough-ization of the crystal grain with is suppressed, and also suppresses occurrence of a crack to a severe bending while it prevents and has big and rough-ization of a sludge and smoothing of the surface roughness after etching is carried out to 1 micrometer or less Less than [Fe:0.007%] and less than [Mo:0.0002%], a desired effect is not acquired for the content by the aforementioned operation, respectively. Since hot rolling nature and bending nature came to have fallen on the other hand when the content exceeded Fe:0.25% and Mo:0.03%, the content was determined as Fe:0.007-0.25% and Mo:0.0002-0.03%.

[Translation done.]

EXAMPLE

[Example] Below, an example explains Cu alloy plate of this invention concretely. Cu alloy molten metal with the component composition shown in Tables 1-3 by the usual low frequency slot type smelter, respectively is prepared. It considers as the ingot which had a thickness:160mmx width-of-face:450mmx length:1600mm dimension by the semi-continuous casting method. Perform hot rolling to this ingot at the predetermined rolling start temperature within the limits of 750-980 degrees C, consider as thickness:11mm ******, and to this ******, after water cooling, where facing of every 0.5mm and the both-sides edge is carried out every 3mm, respectively, vertical both sides Where it gave the Rate:of Rolling87% cold rolling, and it considered as thickness:1.32mm ****** and interval **** of a hold is further given the predetermined temperature within the limits of 400-650 degrees C for 1 hour at this Give a Rate:of Rolling75% cold rolling, and it considers as thickness:0.33mm ******. Subsequently, after holding for 5 to 300 seconds at this to the predetermined temperature within the limits of 750-950 degrees C, It is 40 degrees C/sec about a 750-500-degree C temperature requirement. Solution treatment cooled with the above cooling rate is performed. By performing precipitation processing of a hold to the predetermined temperature within the limits of 400-500 degrees C succeedingly for 3 hours, performing a rate:of rolling25% cold rolling further, and a hold being oval to the predetermined temperature within the limits of 250-350 degrees C, and finally, giving an annealing to it for 1 hour Cu alloy plates 1-4 were manufactured, respectively this invention Cu alloy plates 1-14 of the diameter of mean crystal grain and sludge overall diameter which are similarly shown in Tables 1-3, respectively, the comparison Cu alloy plates 1-9, and conventionally.

[0012] In addition, the component content (* mark is attached) of either of the constituents of Cu alloy separates from the comparison Cu alloy plates 1-9 from this invention domain. Moreover, the diameter of mean crystal grain was measured using the light microscope, further, measured ten arbitration by one 5000 times the scale factor of this about the sludge using the scanning electron microscope, and showed the sludge which showed the overall diameter among this measurement part.

[0013] Next, about various kinds of Cu alloy plates obtained as a result, tensile strength and elongation were measured with JIS and the tension test based on Z2241, similarly conductivity was measured based on JIS and H0505, the bending examination and the heat friction test of solder were performed further, and the surface roughness of an etching side was also measured.

[0014] minimum bend-radius: in which, as for a bending examination, a crack generates a bending shaft on the surface of a test piece for a rolling parallel direction (the bad way orientation) according to JIS and the V block method of Z2248 -- r (mm) -- measuring -- the ratio of this r and thickness:t of a test piece -- it carried out by evaluating by :r/t

[0015] The heat friction test of solder processes the test piece with the thickness:0.25mmx width-of-face:15mmx length:60mm dimension by rosin flux, and is immersed during the solder bath of a temperature:230 degree C 60%Sn-40%Pb alloy. Make the aforementioned solder adhere to the front face, and it heats on condition that a hold at temperature:150 degree C among the atmospheric air in this status for 1000 hours. It carried out after heating on the conditions which carry out 180 degree adhesion bending of the test piece, and return it 180 degrees again, the existence of the solder sublation in this 180 degree bending section was observed, and the heat-resistant detachability of solder was evaluated.

[0016] moreover, temperature:45 degree C [after the surface roughness of an etching side degreases the front face of a test piece] 42% ferric-chloride aqueous solution -- being immersed -- the thickness orientation -- 0.1**0.02mm -- etching -- the etching side of this result -- a rolling direction -- receiving -- the right-angled orientation -- length: -- the surface roughness of every ten 0.8mm arbitration was measured, and it was shown with the highest (coarse) surface roughness among this ten measurement result These measurement results were shown in Tables 4 and 5.

[0017]

[Table 1]

[0018]
[Table 2]

種別		成分組成（重量%）								平均結晶粒径（μm）	析出物の最大径（μm）
		Ni	Si	Sn	Mg	Zn	Fe	Mo	Cu+不純物		
本発明Cu合金板材	1	0.48	0.07	2.41	0.121	0.90	0.211	0.0128	残	8	0.6
	2	1.95	0.51	0.47	0.005	0.87	0.012	0.0004	残	15	1.3
	3	4.67	1.12	0.51	0.008	0.95	0.062	0.0008	残	8	1.6
	4	1.88	0.47	0.09	0.011	1.02	0.051	0.0011	残	12	0.8
	5	1.96	0.44	0.56	0.008	1.06	0.055	0.0009	残	10	0.9
	6	1.83	0.45	2.23	0.009	0.92	0.048	0.0008	残	11	0.8
	7	1.95	0.52	0.51	0.010	0.12	0.070	0.0008	残	10	0.9
	8	2.02	0.45	0.44	0.008	2.94	0.066	0.0006	残	12	1.1
	9	2.12	0.50	0.49	0.002	0.93	0.032	0.0013	残	8	0.6
	10	1.95	0.48	0.52	0.189	0.95	0.045	0.0008	残	10	1.0

[0019]
[Table 3]

種別		成分組成（重量%）								平均結晶粒径（μm）	析出物の最大径（μm）
		Ni	Si	Sn	Mg	Zn	Fe	Mo	Cu+不純物		
本発明Cu合金板材	11	1.93	0.40	0.47	0.003	1.02	0.008	0.0009	残	25	1.1
	12	1.89	0.53	0.46	0.013	0.88	0.238	0.0011	残	10	0.7
	13	2.04	0.44	0.49	0.009	0.87	0.014	0.0003	残	25	1.5
	14	1.93	0.47	0.51	0.011	0.85	0.058	0.0252	残	6	0.5
比較Cu合金板材	1	0.33*	0.10	0.45	0.008	0.85	0.021	0.0006	残	18	1.1
	2	5.19*	1.11	0.85	0.003	0.72	0.043	0.0004	残	14	2.0
	3	2.03	0.04*	0.43	0.009	0.84	0.045	0.0011	残	18	0.7
	4	2.15	1.34*	0.64	0.006	0.82	0.065	0.0009	残	8	0.9
	5	1.78	0.40	0.05*	0.005	0.81	0.052	0.0004	残	12	1.5
	6	1.95	0.45	2.72*	0.008	0.83	0.055	0.0008	残	10	0.9

（＊印：本発明範囲外）

[0020]
[Table 4]

種別		成分組成（重量%）								平均結晶粒径（μm）	析出物の最大径（μm）
		Ni	Si	Sn	Mg	Zn	Fe	Mo	Cu+不純物		
比較合金Cu板材	7	1.94	0.67	0.44	0.004	0.08*	0.043	0.0010	残	11	1.1
	8	2.03	0.47	0.51	0.004	0.83	0.005*	-*	残	50*	6.5*
	9	1.93	0.58	0.38	0.009	0.95	0.283*	0.0342*	残	8	0.6
従来Cu合金板材	1	0.93	0.23	2.06	0.104	-	-	-	残	70	5.5
	2	1.98	0.63	0.78	0.011	-	-	-	残	65	7.5
	3	3.85	1.09	0.63	0.102	-	-	-	残	50	8.0
	4	1.94	0.77	3.92	0.096	-	-	-	残	60	7.0

（*印：本発明範囲外）

種別		引張強さ (N／mm²)	伸び (%)	導電率 (%) IACS	曲げ加工性 (r／t)	はんだ剥離の有無	エッチング面の表面粗さ (μm)
本発明Cu合金板材	1	760	6	35	1.6	無	0.7
	2	815	9	43	1.4	無	0.8
	3	920	9	36	1.6	無	0.9
	4	780	7	49	1.2	無	0.8
	5	810	9	42	1.2	無	0.8
	6	860	10	35	0.8	無	0.7
	7	815	9	44	1.0	無	0.7
	8	815	8	39	1.2	無	0.8
	9	820	7	43	1.2	無	0.7
	10	815	8	38	1.0	無	0.8
	11	810	9	43	1.6	無	0.8
	12	815	8	41	1.0	無	0.8
	13	805	9	42	1.6	無	0.9
	14	790	6	43	1.6	無	0.7

[0021]
[Table 5]

種別		引張強さ (N／mm²)	伸び (%)	導電率 (%) IACS	曲げ加工性 (r／t)	はんだ剥離の有無	エッチング面の表面粗さ (μm)
比較Cu合金板材	1	580	8	48	1.6	無	0.9
	2	920	9	30	1.8	有	1.2
	3	520	7	38	1.0	無	0.9
	4	810	9	31	1.8	有	0.7
	5	680	8	53	1.8	無	0.9
	6	850	9	24	1.0	無	0.8
	7	820	8	37	1.8	有	0.8
	8	810	8	38	5.0	無	3.0
	9	810	4	39	3.6	無	0.7
従来Cu合金板材	1	780	7	36	3.8	有	2.9
	2	810	8	33	6.0	有	3.2
	3	870	9	35	6.5	有	3.5
	4	900	9	20	4.5	有	3.0

[Translation done.]